



Poultry Nutrition Information for the Small Flock

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A sound nutrition program is essential to a successful poultry operation. From an economic standpoint, feeding accounts for 60 to 70 percent of the cost of production. To maximize production at the least cost, producers should pay close attention to the nutritional requirements of the species. The word nutrient refers to a broad category of organic and inorganic compounds found in food that are essential for maximum growth, egg production and feed efficiency. Feed efficiency refers to the amount of food, in pounds, required to produce a pound of body weight, or in the case of egg production, pounds of feed required to produce a dozen eggs. Nutrients essential for building and maintaining a successful poultry flock include water, carbohydrates, fat, protein, vitamins, and minerals. This publication addresses the function of individual nutrients and notes variations in nutrient requirements among classes of poultry. It may be useful for small flock producers, hobbyists, and commercial producers.

Water

Without a doubt, water is the most important nutrient required by poultry. It is the least expensive, and usually the most neglected.

Water represents about 70 percent of the total body weight of poultry and around 65 percent of the total weight of eggs.

Decreased production or mortality will occur sooner with water deprivation than food deprivation. This is especially noticeable during the summer when outside temperatures are high. Water helps regulate body temperature, lubricate and transport feed through the digestive tract, and eliminate waste.

There is no precise water requirement for poultry because water intake is related to numerous factors including age, body condition, diet, temperature, humidity, and accessibility. As a rule of thumb, poultry will consume twice as much water as feed. This is subject to change depend-


ing on environmental conditions.

For the flock to achieve maximum production efficiency, water should be readily available and free of pathogenic microorganisms and toxic levels of minerals and chemicals. Zero units total bacteria and total coliform bacteria per milliliter of water is desirable. The maximum acceptable level is 100 units of total bacteria and 50 units of coliform bacteria per milliliter of water.

Excessive mineral levels may adversely affect performance. One of the main consequences of high mineral levels in drinking water is an increase in wet litter. Wet litter provides a good growth medium for mold and bacteria, which can reduce performance and flock health. The water supply should be tested if there is concern about its safety for consumption.

Carbohydrates

Certain carbohydrates are required in order for



the body to use other nutrients. Carbohydrate storage in the body is relatively small compared to fat storage. The limited carbohydrate storage occurs in the liver and muscle in the form of glycogen. Glycogen is a highly branched structure composed of glucose. Plant carbohydrate energy is stored in the form of starch, which is also a highly branched structure composed of glucose. Carbohydrates and fats are usually grouped together under a larger category referred to as energy.

Dietary energy is needed to support production and maintenance. Growth rate and/or egg production are factors that affect the energy required for production. Other factors include body size, environmental conditions, level of activity, stress factors, such as disease and parasites, and rate of feathering.

Carbohydrates are the largest source of energy used in poultry diets. Carbohydrates common in poultry diets are starches, sugars, cellulose, and other non-starch compounds. Cellulose and the non-starch compounds are typically classified as crude fiber. Most starches and sugars are used well by poultry; the fiber portion is not.

In formulating poultry diets efforts are made to minimize the fiber concentration. This is in contrast to human nutrition where a high-fiber diet is recommended. Poultry lack certain digestive enzymes required to digest the

various fiber components. Important sources of carbohydrates for poultry include cereal grains and cereal grain by-products.

Fats

Fats perform certain physiological functions within the body. They are used as an energy reserve, insulation against temperature extremes, tissue membranes, and to protect vital organs. A group of vitamins referred to as fat-soluble require the presence of fat in order to be effectively absorbed by the body. Fats are used to increase the energy content of the diet. Using carbohydrates by themselves fails to achieve the target energy level. Fat has 2.25 times more energy than carbohydrates on an equal-weight basis. Fats are composed of smaller components known as fatty acids. Of these fatty acids, poultry have a specific requirement for linoleic acid, so it is termed an essential dietary fatty acid. Essential means it must be provided in the diet because the body can not construct it out of other compounds. The feeding value of fat varies depending on whether it is unsaturated or saturated. Young poultry are less able to digest saturated fats. At room temperature, unsaturated fat is a liquid, while saturated fat is a solid. Corn oil, soy oil, and canola oil are examples of unsaturated fat. Tallow, lard, poultry fat, and choice white grease are examples of saturated fat. In addition to its nutritional value, adding fat to the feed aids in reducing

grain dust. Nutritionists typically use animal fat or an animal-vegetable fat blend when balancing poultry diets. Competition with the human food market usually results in high prices for vegetable oils. The high cost prohibits use when formulating least-cost rations. An antioxidant should be added to poultry diets when fat is added in order to prevent the fat from turning rancid. This is especially important during hot weather.

Proteins

Proteins are a large complex class of nutrients composed of smaller units known as amino acids. The location of proteins in the body is quite broad. Proteins are found in structural tissue, blood, enzymes, and hormones.

On a dry-weight basis, the body of a mature broiler is more than 65 percent protein. The contents of an egg are about 50 percent protein. Digestion of feed proteins results in the liberation of individual amino acids.

For nutritional purposes amino acids are grouped into two categories known as essential (indispensable) and non-essential (dispensable). Essential amino acids are those that cannot be synthesized in adequate amounts to meet growth and maintenance requirements. There are 22 amino acids commonly found in feed ingredients. Eleven of the 22 amino acids, referred to as essential amino acids, must be provided in poultry diets.

Nonessential amino acids are those the body can make in sufficient amounts as long as the appropriate starting compounds are available. The presence or absence of essential amino acids will dictate the quality of the feed protein. Lysine and methionine are the two most critical amino acids in poultry nutrition. Deficiencies of these two amino acids leads to a significant loss in productive efficiency.

Nutritionists will typically employ multiple ingredients to meet the amino acid needs of poultry because there is no single ingredient that contains adequate amounts of the essential amino acids. This concept is referred to as the use of complementary proteins. An example is the use of corn, which is low in lysine, and soybean meal, which is low in methionine, together in a ration. By themselves neither corn or soybean meal can provide enough essential amino acids to maximize performance. But when the two are combined, they provide adequate amounts of the essential amino acids and are said to complement each other.

Amino acid supplements are typically included in poultry diets because of the economic advantage of adding them to the diets. These amino acid supplements include l-lysine hydrochloride and dl-methionine.

Vitamins

Vitamins are a group of organic compounds found

in foods in small quantities. Like the other nutrients, they are an essential part of a good nutrition program. Adequate intake levels of vitamins are necessary for normal body functions, growth and reproduction. Vitamin deficiencies can lead to a number of diseases or syndromes.

Vitamins can be divided into two classes: fat soluble and water soluble. The fat-soluble vitamins include vitamins A, D₃, E, and K. Vitamin A is required for normal growth and development of epithelial tissue and reproduction in poultry. Vitamin D₃ is required for normal growth and development of bones and for eggshell formation. Vitamin K is an essential part of blood-clot formation. Vitamin E is a powerful antioxidant.

The water-soluble vitamins include the B-complex vitamins — vitamin B₁₂, biotin, choline, folacin, niacin, pantothenic acid, pyridoxine, riboflavin, and thiamin — and vitamin C. The B-complex vitamins are involved with many metabolic functions including energy metabolism. Poultry can synthesize vitamin C, so no requirement has been established for this vitamin. It may be beneficial in some circumstances, such as birds subjected to stress.

Nutritionists usually add a vitamin premix to the diet to compensate for fluctuating levels found naturally in food. This ensures the bird has the required amounts necessary for normal productive efficiency.

Minerals

Minerals are inorganic compounds divided into two classes: macrominerals and microminerals. Macrominerals are needed in relatively large amounts, and microminerals in small amounts.

The macrominerals include calcium, phosphorus, chlorine, magnesium, potassium, and sodium. Calcium is important for normal bone development, blood-clot formation, muscle contraction and maintaining good eggshell quality. Phosphorus also is important for normal bone development. It is a component of cellular membranes and a requirement for many metabolic functions.

Chlorine is used in digestion as a component of hydrochloric acid found in the stomach. It is involved in water and acid/base balance in the body. Sodium and potassium are electrolytes important for metabolic, muscle, and nerve functions. They also are involved with water and acid/base balance. Magnesium assists with metabolic and muscle functions.

The microminerals involved in metabolic functions include copper, iodine, iron, manganese, selenium and zinc. Iodine is used to produce thyroid hormones that regulate the rate of energy metabolism. Zinc is involved with many enzymatic processes in the body. Iron aids in oxygen transportation within the body. Selenium has antioxidative properties

but may be toxic at high levels. Ground limestone and oyster shell are the primary sources of calcium. Phosphorus and other calcium sources include monocalcium phosphate, dicalcium phosphate and deflourinated phosphate. Common salt is the primary source of sodium and chlorine.

The levels of magnesium, potassium and other minerals not listed here typically will be supplied by other dietary ingredients such as corn, soybean meal, and meat and bone meal. Nutritionists use trace mineral (micromineral) premixes when formulating diets to supply the required amounts of microminerals needed for production and maintenance.

Summary

The productivity, reproduction and health of the flock greatly depends on the quality of the feed they receive. Make sure the feed is appropriate for the bird species. For example, do not feed layer mash to growing chicks because the calcium content will be too high and other nutrients too low. This will result in reduced performance and can lead to mortality.

Likewise, do not feed broiler or turkey feed to laying hens because the calcium is too low and other nutrients too high. This will result in poor eggshell quality and reduced egg production.

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